

A simple and inexpensive self-registering auxanometer.

HERMON C. BUMPUS.

(WITH PLATE VII.)

Wishing to try a few experiments on the growth of plants, and not having the ordinary self-registering apparatus used by Pfeffer, Baranetzky and others, I was led to improvise the instrument which is figured in plate VII. For a support for both apparatus and plant, I found a broad window-sill was quite free from any appreciable jar.

The auxanometer proper (fig. 4) is very similar to that figured by Dr. Goodale, consisting of an horizontal arm supported to the casing by the bracket *v*, and bearing two strips of tin, notched at *m*, where rests the axis of the spool, *o*, over which the thread, *p*, is allowed to pass twice, being attached to the plant at *r* by means of a small needle thrust through the leaf, and kept taut by the light weight *p'*.

The indicator, *l*, is easily made by joining two or three straws, as recommended by Prof. Bessey, which may be found at any apothecary's. The terminal portion may then be made into a style by carefully splitting back a sliver until it makes an angle of about 30° with its former position, and the tip, nicely sharpened, again bent abruptly at an angle of nearly 90° . This long arm, *l*, should be balanced by a movable weight at *u*. The axis, *m*, should be rather long, that the arm may swing, if necessary, in several parallel planes.

The registering surface (figs. 2 and 3) is a piece of flat glass which has been held over a burning rag previously saturated with turpentine. The smoked plate, *d*, is held by a frame, *c*, which is free to move, in obedience to the weight *u*, in the same plane as the arm *l*, by means of the wheels *a, a*, the axes of which are held by pieces of notched tin at *b, b*, bearings which have but little friction.

By moving the axis at *m* the style may be gently placed against the smoked glass, and as the plant grows an arc will be drawn from top to bottom, or if the weight *u* is allowed to act a line will be drawn from right to left. The motion in obedience to the weight may be made regularly intermittent, and as a result we shall have a zigzag line, the distance between every two angles of which signifies a regular interval.

The interrupted movement may be brought about by having a strip, *e*, bearing at regular intervals round wire nails, attached to the lower portion of the carriage.


One of these nails is held for a certain time by the hook *h* (fig. 5), which is attached to the strip *f* (figs. 5, 2, 1), which moves about the pivot *g* (fig. 1). Finally, when *h* is elevated, *h'*, which is attached to a similar and parallel rod and moves with *f* about *g*, catches the next succeeding nail, and holds it a regular period, before allowing it to reach *h*. A short horizontal line is thus drawn by the style at *w* (fig. 2).

The elevating and depressing of the escapement at *h h'* is brought about by attaching the works of one of the cheap nickel-plated clocks, which will run when held in any position, to a board, *k* (figs. 2 and 3). In place of the "long hand" there is attached a crank which will play through the slot *i* (fig. 5). As the post turns the crank toward XII o'clock *h* will be elevated, and at VI o'clock, thirty minutes later, *h'* will be depressed to its greatest, one nail thus sliding by every half hour. The escapement hooks may be easily cut out of two pieces of tin.

If the arm does not swing parallel with the smoked surface, change the screws at *x* (fig. 3).

One recommendation the apparatus has is its inexpensiveness, costing, with the clock, if one is his own carpenter, not more than three dollars. Another is the ease with which the records for several half hours may be compared, and the little labor necessary to prepare permanent records, by simply placing the glass on a piece of "blue print" paper and exposing to sunlight.

A registering auxanometer.

CHARLES R. BARNES. 

(WITH PLATE VIII.)

In January last my class in physiology had occasion to study the rate of growth of seedlings under various conditions. I needed an instrument to keep a continuous record of their growth, and Germany was too far away to send for one. With the help of the students in the mechanic shop I arranged and constructed the instrument here described. It is comparatively simple and inexpensive, and requires no